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*Begin Your Engineering Career
 in Electrical Engineering & Telecommunications*

BASIC ELECTRONICS

Color Code				
0 = black	1 = brown	2 = red	3 = orange	4 = yellow
5 = green	6 = blue	7 = violet	8 = gray	9 = white
×0.1 or ±5% = gold			×0.01 or ±10% = silver	

Metric Prefixes			
Symbol	Prefix	Multiplier	Power of Ten
T	tera	1,000,000,000,000	10 ¹²
G	giga	1,000,000,000	10 ⁹
M	mega	1,000,000	10 ⁶
k	kilo	1000	10 ³
m	milli	0.001	10 ⁻³
μ	micro	0.000 001	10 ⁻⁶
n	nano	0.000 000 001	10 ⁻⁹
p	pico	0.000 000 000 001	10 ⁻¹²

Digital Terminology
Kb = Kilo bit (1024 bits)
KB = Kilo Byte (1024 Bytes)
Mb = Mega bit (1024 × 1024 bits)
MB = Mega Byte (1024 × 1024 Bytes)

Original designed by: Dan Landiss

Term	Unit	Symbol	Formulas
Capacitance	Farad, F	C	$C_p = C_1 + C_2 + C_3$ $C_s = 1 / (1/C_1 + 1/C_2 + 1/C_3)$ $C = 1 / (2\pi f X_C)$
Capacitive reactance	Ohm, Ω	X _C	$X_C = 1 / (2\pi f C)$ $X_C = V_C / I_C$
Charge	Coulomb, C	q	$q = It$ $1 C = 6.24 \times 10^{18}$ electrons
Conductance	Siemen, S Mho	G	$G = 1/R, \quad G = I/V$ $G_p = G_1 + G_2 + G_3$ $G_s = 1 / (1/G_1 + 1/G_2 + 1/G_3)$
Current	Ampere, A	I	$I = V/R, \quad I = VG$ $I_p = I_1 + I_2 + I_3$ $I_s =$ in all components
Frequency	Hertz, Hz	f	$f = 1/T$ $f_0 = 1 / (2\pi(LC)^{1/2})$
Impedance	Ohm, Ω	Z	$Z = V/I$ $Z_s = (R^2 + (X_L - X_C)^2)^{1/2}$
Inductance	Henry, H	L	$L_s = L_1 + L_2 \pm 2M$ $L = X_L / (2\pi f)$
Inductive reactance	Ohm, Ω	X _L	$X_L = V_L / I_L$ $X_L = 2\pi f L$
Mutual inductance	Henry, H	M	$k(L_1 L_2)^{1/2}$
Period	Second, s	T	$T = 1/f$
Phase angle	Degree, °	θ	$\theta = \text{radians} \times (180/\pi)$
Power	Watt, W	P	$P = VI$ $P = I^2 R$ $P = V^2 / R$
Resistance	Ohm, Ω	R	$R = V/I, \quad R = 1/G$ $R_s = R_1 + R_2 + R_3$ $R_p = 1 / (1/R_1 + 1/R_2 + 1/R_3)$
Voltage (EMF)	Volt, V	V or E	$V = IR, \quad V = I/G$ $V = IX, \quad V = IZ$ $V_s = V_1 + V_2 + V_3$ $V_p =$ across all branches